

## Tips on "RF Proofing"

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Radio frequency energy from nearby AM, FM, TV or 2-way radio transmitting sites can affect our equipment. We have taken some internal precautions to prevent outside RF sources from getting into our circuitry, but these don't cover all of the possibilities. The two primary paths for RF interference are via the telephone line (POTS or ISDN), and through the audio connections.

POTS and ISDN codecs may operate erratically if a substantial amount of RF is present on the phone line. This RF appears in "common-mode" on the line (equal signal on both wires) and can be easily filtered out without affecting modem or TA performance at all. If you are running codecs at a transmitter site, you should include some filtering on the line.

Gone are the days when "Ma Bell" would put free RF filters on your phone lines. It's now your problem, but fortunately such filters are easily available. We have tried filters from two manufacturers, Coilcraft, and K-Com. Both work very well. Their filters with modular phone plugs/jacks are easy to use. The K-Com "wired-in" filters may be a good choice for more complicated installations.

Most telephone line RF interference is caused by AM broadcasting; FM and TV is less of an issue, and the filters inside our products are pretty effective at those higher frequencies. When buying an external filter for AM broadcast interference, be sure to pick one that works well in the 0.5 – 3.0 MHz range. "Ham Radio" and "CB" filters are best in the 3 - 30 MHz range, and may do enough filtering at the lower frequencies.

Audio inputs and outputs are vulnerable to RF interference, particularly at FM, TV and 2-way frequencies. We have found that the headphone outputs are more vulnerable than XLR inputs or outputs. While we do some RF bypassing inside our products, we have to limit it to avoid degrading the frequency response or common-mode rejection.

As with the telephone line, the RF appears in common-mode on all of the audio wires. Depending on how the grounding is routed inside the equipment, even shielded cables may bring RF through the jack. Unlike the telephone problem, you may hear the station's audio mixed in with your own.

The best approach at the higher frequencies is to use "clamp-around" ferrite chokes on the audio cables, as close to the connector as possible. Radio Shack's 273-105 choke works well, and should be locally available. Digi-Key sells clamp-on cylinder and box shaped chokes in a variety of sizes. You may also find similar products from computer supply stores, usually sold to prevent RF interference from video monitor cables, etc. It may take more than one choke to eliminate the problem.

AM broadcast interference into audio lines may be harder to cure. Try different grounding options, and winding the audio cables on ferrite rods. Such rods can be scrounged from old AM radios, or purchased from suppliers like Amidon Associates.